

# New taxa of land snails from French Guiana

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## ABSTRACT

Three new species and a new genus of terrestrial gastropods are described from the Réserve naturelle des Nouragues in French Guiana. *Cyclopedus anselini* n. gen., n. sp. (forming new monotypic genus in the family Neocyclotidae Kobelt & Möllendorff, 1897) seems to be the smallest known cyclophoroid in the western hemisphere. The descriptions of the other two new species, *Pseudosubulina theoripkeni* n. sp. and *P. nouraguensis* n. sp., from the family Spiraxidae Baker, 1939, extend not only our knowledge of the geographical distribution of *Pseudosubulina* Strebel & Pfeffer, 1882 (previously known with certainty from Mexico only) but also the diagnosis of this genus, which now includes species with large penial stimulator and apertural dentition.

## KEYWORDS

South America,  
Neocyclotidae,  
Spiraxidae,  
new genus,  
new species.

## RÉSUMÉ

*Nouveaux taxons d'escargots terrestres de Guyane française.*

Trois nouvelles espèces et un nouveau genre de gastéropodes terrestres sont décrits de la Réserve naturelle des Nouragues, en Guyane française. *Cyclopedus anselini* n. gen., n. sp., pour lequel le nouveau genre monotypique *Cyclopedus* n. gen. est établi, semble être le plus petit cyclophoroïde connu de l'hémisphère occidental. La description des deux autres nouvelles espèces de *Pseudosubulina* Strebel & Pfeffer, 1882 (Spiraxidae Baker, 1939), *P. theoripkeni* n. sp. et *P. nouraguensis* n. sp., étend notre connaissance de ce genre non seulement sur sa distribution géographique (jusqu'à présent connu avec certitude du Mexique seulement), mais également sur sa diagnose, puisqu'il comprend désormais des espèces avec un important stimulateur pénien et une dentition aperturale.

## MOTS CLÉS

Amérique du Sud,  
Neocyclotidae,  
Spiraxidae,  
genre nouveau,  
espèces nouvelles.

## INTRODUCTION

French Guiana land snails have been scarcely studied. The first picture was drawn by Drouët (1859), followed 121 years later by the comprehensive work of Tillier (1980). These two major contributions were subsequently updated by Massemin *et al.* (2009), who illustrated all known species from French Guiana (including few undescribed ones).

Drouët (1859) described a very poor habitat for land snails, and a generally low abundance. Gargominy & Ripken (1998) demonstrated that this fauna can nevertheless be very diverse in respect of minute species. In 1997 and 1999, the extensive sieving of leaf litter and soil performed by these authors revealed a rich community of the ground dwelling land snails, with up to 19 species on 1 m<sup>2</sup> on lateritic soil of tropical forest in the Nouragues Reserve. Most of these snails are minute (less than 2 mm in diameter). Out of the 34 species collected in 1 km<sup>2</sup>, 23 were not previously known from French Guiana and most of them are probably new to science.

In this paper we describe three new species and establish one new genus from the 1997 samples.

## MATERIAL AND METHODS

The material was collected by T. E. J. Ripken & O. Gargominy during October and November 1997, mainly at the Nouragues field station, located c. 4°05'N, 52°41'W within the Réserve naturelle des Nouragues in French Guiana. The study area is composed of 1 km<sup>2</sup> with paths every 100 m and stays within the reserve specifically dedicated to scientific research within the protected area, well described by Charles-Dominique (2001). It is covered by extensive primary forest uninhabited by humans for over two centuries, and is noteworthy for its inselberg, a granitic outcrop a few hundred meters above the surrounding lateritic plateau. The Nouragues creek (river) crosses the studied km<sup>2</sup> about NE to SW (Fig. 1), with the beginning of the lateritic plateau on its left bank and the granitic foothill of the inselberg on its right bank, also with

some lateritic remnants coming from the erosion of the plateau (Grimaldi & Riéra 2001). The area is totally devoid of limestone. Each sample was taken based on the grid furnished by the station staff (Fig. 1). The square number that is given in the descriptions of localities below refers to this nomenclature.

As land snails were generally found at low abundance, extensive sieving was undertaken, which generated about 75 L of leaf litter that was sorted by naked eye and under the microscope.

Additionally, one shell was collected at Route de Cacao, Roura (4.56548°N, 52.41922°W).

The INVMAR number refers to the station identifier in the MNHN collection database.

Each type is accessible on the web through the permalink: <http://coldb.mnhn.fr/CatalogNumber/MNHN/IM/XXXX>, where XXXX is the number given for all types thereafter.

## SYSTEMATICS

Clade CAENOGASTROPODA Cox, 1960

Super-family CYCLOPHOROIDEA Gray, 1847

Family NEOCYCLOTIDAE

Kobelt & Möllendorff, 1897

Subfamily AMPHICYCLOTINAE

Kobelt & Möllendorff, 1897

Genus *Cyclopedus* n. gen.

TYPE SPECIES. — *Cyclopedus anselini* n. sp. by monotypy.

ETYMOLOGY. — From the Greek, “cyclo-” for circle, which refers to the perfect spire of the shell and is related to the names of other genera in this super-family, “-pedus” for child, which refers to the small size of the shell. Cyclopède is also a dedication to the French humorist Pierre Desproges.

DIAGNOSIS. — Genus characterised by the small shell size and unique teleoconch sculpture of fine impressed dots arranged in spiral lines. Operculum similar to that of *Ptychocochlis* Simpson, 1895 in having elevated translucent lamellae expanded at the summit and connected to the succeeding whorl, thus forming a completely closed channel in cross section. However, in *Ptychocochlis* these lamellae form visible steps on the outer surface of the operculum, while in *Cyclopedus* n. gen. this surface is flat.

## DESCRIPTION

Shell small (height from 3.0 to 3.5 mm, major diameter from 3.6 to 4.2 mm), umbilicate, dextral, broadly conical with straight outline, elevated, rather thin, light corneous, semi-translucent. Whorls 3.8–4.0, regularly rounded with a deep straight suture all the way to the aperture. Protoconch two whorls, with eight spiral flat ribs. Protoconch/teleoconch transition distinct because of change in microsculpture and discontinuity of growth. Surface of teleoconch with growth lines and occasional varices (discontinuity in growth); sculpture of fine impressed dots arranged in spiral lines irregularly spaced from 0.1 to 0.75 mm and inconspicuous ribs (about 40 on the body whorl) separated by 5–10 growth lines. Aperture circular, not cut by penultimate whorl and clearly delineated but not detached from it in fully grown specimens. Peristome complete, simple, acute, not reflected. Umbilicus open, 5.5 times smaller than major diameter, V-shaped.

Operculum almost circular (about 1.8 mm in diameter), corneous, externally concave and internally convex, without any visible steps on both sides, spirally coiled, with elevated translucent lamellae expanded at the summit and connected to the succeeding whorl, thus forming completely closed channel in cross section.

*Cyclopedus anselini* n. sp.

(Fig. 2)

**TYPE MATERIAL.** — Holotype: French Guiana, Réserve naturelle des Nouragues, Nouragues field station (c. 4°05'N, 52°41'W; N10 square), 140 m a.s.l., T. E. J. Ripken & O. Gargominy, 11.XI.1997, leaf litter on lateritic soil in a natural forest gap (INVMAR21029), MNHN 25066. Paratypes: same data as holotype, 1 specimen used for SEM photographs, MNHN 25067. — Same data, but M12 square, 08.XI.1997, leaf litter on lateritic soil (INVMAR21021), 1 specimen, MNHN 25138. — Same data, but N15 square, 155 m a.s.l., 15.XI.1997, leaf litter in buttresses of tree (tree code N-15-138) (INVMAR21038), 1 specimen, MNHN 25139.

**OTHER MATERIAL EXAMINED.** — Same data as paratype MNHN 25139, 3 damaged shells (MNHN).

**TYPE LOCALITY.** — Nouragues field station (c. 4°05'N, 52°41'W), Réserve naturelle des Nouragues, French Guiana.

**ETYMOLOGY.** — This species is dedicated to Anselin Baradat for the most powerful bond that ties him with the first author.

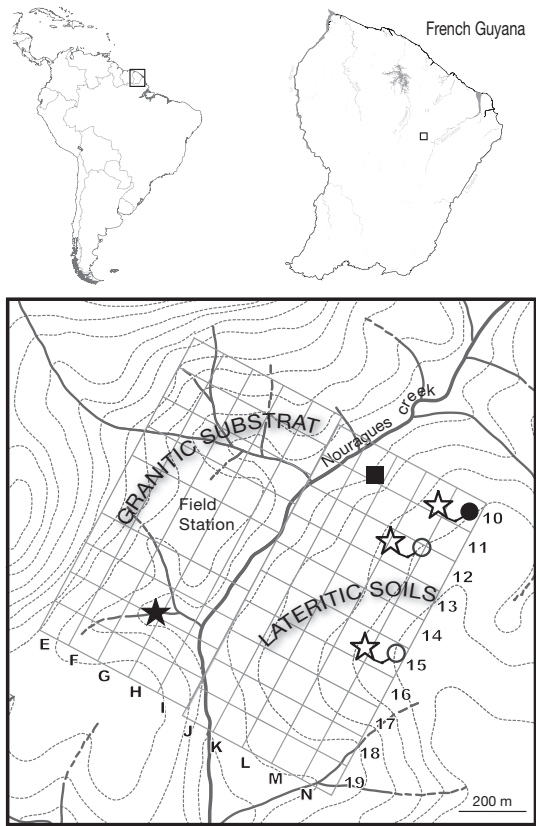


FIG. 1. — The study area (nomenclature of the grid) and distribution of the new species. ●, ○, *Cyclopedus anselini* n. gen., n. sp.; ★, ☆, *Pseudosubulina theopikeni* n. sp.; ■, *Pseudosubulina nouraguensis* n. sp.; type localities in black, other localities in white. Partly drawn after Charles-Dominique (2001: fig. 4).

**DIAGNOSIS.** — A small South American cyclophoroid species (less than 3.5 mm in height and less than 4.2 mm in diameter) characterised by its unique teleoconch sculpture of fine impressed dots arranged in spiral lines. Operculum almost circular, without any visible steps on both sides, with elevated translucent lamellae expanded at the summit and connected to the succeeding whorl, thus forming a completely closed channel in cross section.

## DESCRIPTION (HOLOTYPE)

Shell small (height 3.2 mm, major diameter 3.7 mm), umbilicate, dextral, broadly conical with straight outline, elevated, rather thin, light corneous, semi-translucent. Whorls 3.9, regularly rounded with a deep straight suture all the way to the aperture. Protoconch two

whorls, with eight spiral flat ribs. Protoconch/teleoconch transition distinct because of change in microsculpture and discontinuity of growth. Surface of teleoconch with growth lines and four varices (discontinuity in growth) in the first 3+ whorls; sculpture of fine impressed dots arranged in spiral lines irregularly spaced from 0.1 to 0.75 mm and inconspicuous ribs (about 40 on the body whorl) separated by 5–10 growth lines. Aperture circular, not cut by penultimate whorl and almost detached from it. Peristome almost complete, simple, acute, not reflected. Umbilicus open, 5.5 times smaller than major diameter, V-shaped.

Operculum almost circular ( $1.8 \times 1.7$  mm), corneous, externally concave and internally convex, spirally coiled having the elevated translucent lamellae expanded at the summit and connected to the succeeding whorl, thus forming completely closed channel in cross section.

HABITAT. — Primary forest, under leaf litter on lateritic soil.

#### REMARKS

The holotype is somewhat juvenile but was chosen as the operculum was available. In fully grown specimens, the aperture is clearly delineated from the penultimate whorl although not detached.

By comparison with species listed by Torre *et al.* (1942), *Cyclopedus anselini* n. gen., n. sp. seems to be the smallest known cyclophoroid in the western hemisphere.

Clade STYLOMMATOPHORA Schmidt, 1855

Super-family TESTACELLOIDEA Gray, 1840

Family SPIRAXIDAE Baker, 1939

Subfamily SPIRAXINAE Baker, 1939

Genus *Pseudosubulina* Strebel & Pfeffer, 1882

*Pseudosubulina* Strebel & Pfeffer, 1882: 117.

TYPE SPECIES. — *Pseudosubulina berendti* Pfeiffer, 1862, by original designation.

DISTRIBUTION. — Central America and Cuba. Record from Jamaica by Schileyko (2000: 840, 841) is based on mistaken classification of *Sigmataxis macrospira* (Adams, 1851).

EMENDATIONS TO THE DIAGNOSIS. — In addition to diagnostic characters indicated by Schileyko (2000: 840, 841), genus now includes species with proximal

penial stimulator, as well as with apertural dentition (see descriptions of two new species below).

#### REMARKS

Thompson (2010: 197) apparently made a mistake stating the presence of an epiphallus in *Pseudosubulina*. There is no epiphallus in the genital apparatus of the type species (*P. berendti*) nor in the new species described below. The vas deferens enters the penis directly through the base of the penial retractor and there are no apparent structural differences between the proximal and distal parts of the penis that could suggest the possibility of a spermatophore creation in the former.

### *Pseudosubulina theoripkeni* n. sp.

(Figs 3; 4)

*Pseudosubulina* sp. — Massemin *et al.* 2009: 417, pl. 9K, 420 (same specimen as Fig. 3D; dissected paratype MNHN 25069).

TYPE MATERIAL. — Holotype: French Guiana, Réserve naturelle des Nouragues, Nouragues field station (c. 4°05'N, 52°41'W; G17 square), 75 m a.s.l., rec. T. E. J. Ripken & O. Gargominy, 03.XI.1997, under leaf litter near stream at the base of granitic rock (INVMAR21004), MNHN 25068. Paratypes: same data as holotype, 2 specimens, MNHN 25069 (dissected) and 25070. — Same data, but M12 square, 140 m a.s.l., 08.XI.1997, leaf litter on lateritic soil (INVMAR21021), 5 specimens, MNHN 25071. — Same data, but N15 square, 155 m a.s.l., T. E. J. Ripken & O. Gargominy, 15.XI.1997, leaf litter on lateritic soil in buttresses of tree (tree code N-15-138) (INVMAR21038) MNHN 25072.

OTHER MATERIAL EXAMINED. — Same data as holotype, 3 damaged shells (MNHN). — Same data, but N10 square, 140 m a.s.l., 11.XI.1997, leaf litter on lateritic soil in a natural forest gap (INVMAR21029), 7 damaged shells (MNHN). — Road to Cacao, 4.56548°N, 52.41922°W, 23.X.1997, T. E. J. Ripken & O. Gargominy, on a burn-and-slash stand (INVAR20978), 1 old shell (MNHN).

TYPE LOCALITY. — Nouragues field station (c. 4°05'N, 52°41'W), Réserve naturelle des Nouragues, French Guiana.

ETYMOLOGY. — This species is dedicated to Theo E. J. Ripken, eminent conchologist, sparkling teacher, friend from the French Guiana field trips and co-discoverer of this species.

DIAGNOSIS. — Shell narrowly umbilicate, slender, turritid with straight outline and obtuse apex; consists of up to 14 evenly rounded, tightly coiled whorls with a deep straight



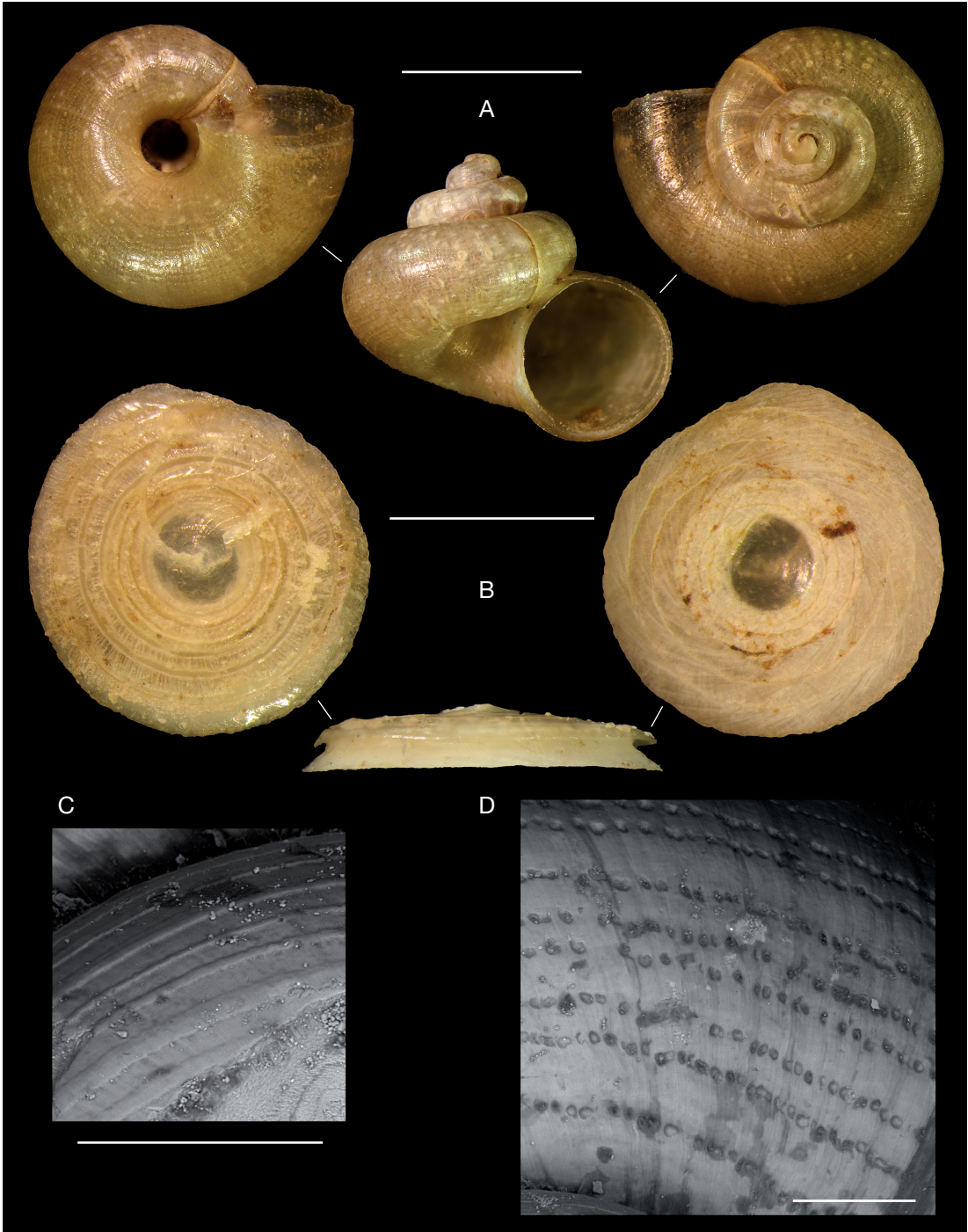


FIG. 2. — *Cyclopedus anselini* n. gen., n. sp.: **A, B**, holotype MNHN 25066 (**B**: operculum); **C, D**, paratype MNHN 25067, details of protoconch (**C**) and teleoconch sculptures (**D**). Scale bars: A, 2 mm; B, 1 mm; C, D, 200 µm.

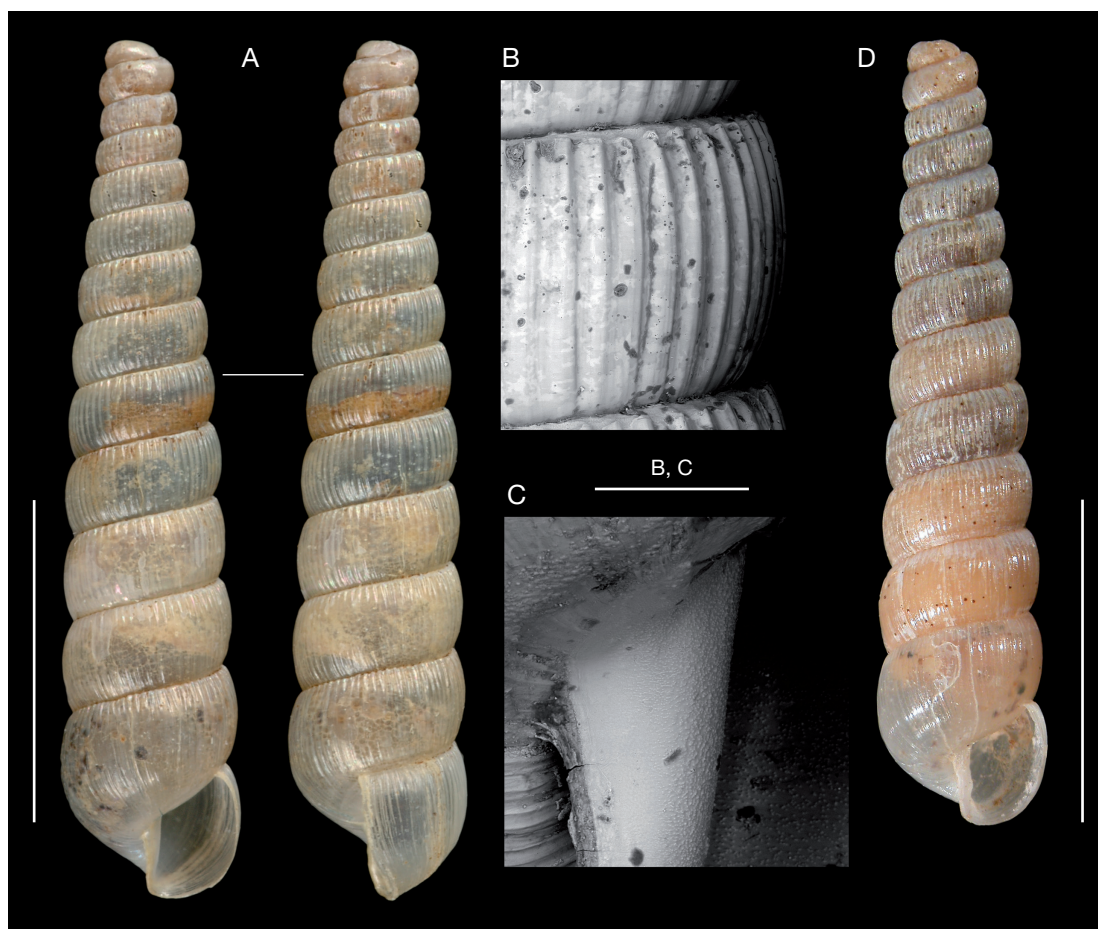


FIG. 3. — *Pseudosubulina theoriipkeni* n. sp.: **A–C**, holotype MNHN 25068; **B**, details of teleoconch sculpture; **C**, details of collumellar surface sculpture; **D**, paratype MNHN 25069 used for dissection. Scale bars: A, D, 5 mm; B, C, 0.5 mm.

crenulated suture. Protoconch glossy with faint radial and spiral sculpture. Surface of teleoconch with strong radial ribs, well defined on early whorls and slightly narrower than intercostal spaces, gradually disappearing below periphery on later whorls. Penis as long as free oviduct, internally with large stimulator and opposing pilaster inside its proximal part.

#### DESCRIPTION (HOLOTYPE)

Shell of normal size for the genus (height 13.3 mm, major diameter 2.9 mm), narrowly umbilicate, dextral, slender, turreted with straight outline, rather thin, semi-translucent, pale corneous. Whorls 13.7, evenly rounded with a deep straight crenulated suture all the way to the aperture. Protoconch 2+ whorls, glossy

with faint radial and spiral sculpture. Protoconch/teleoconch transition distinct because of change in macrosculpture. Surface of teleoconch with strong radial ribs, well defined on early whorls and slightly narrower than intercostal spaces, gradually disappearing below periphery on later whorls. Growth lines visible only just before the aperture. Aperture elongated, orthocline, with approximately 90° columellar-basal angle, cut by penultimate whorl, with whitish parietal callus. Peristome simple, with sharp margin, not reflected except at columellar edge; reflection of columellar edge more developed in its upper part. Umbilicus tiny, not covered by columellar edge.

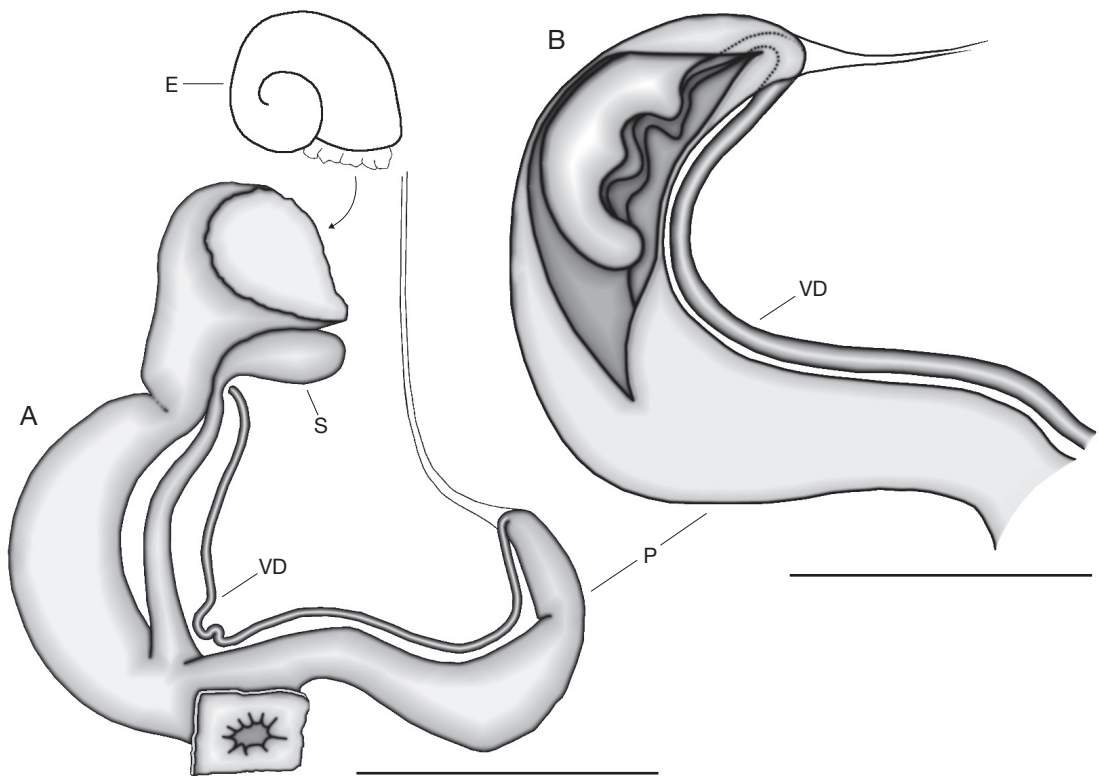


FIG. 4. — Anatomy of *Pseudosubulina theoripkeni* n. sp., paratype MNHN 25069: **A**, distal genitalia; **B**, internal structure of penis. Abbreviations: **E**, one of the embryos; **P**, penis; **S**, spermatheca; **VD**, vas deferens. Scale bars: **A**, 1 mm; **B**, 0,5 mm.

Body white (see illustrated live specimen [paratype MNHN 25069] in Massemin *et al.* [2009: 420]).

#### ANATOMY (PARATYPE MNHN 25069)

Jaw thin, arcuated, vertically striated. Free oviduct long and thickened. Vagina very short. Uterus contains several embryos. Spermatheca with medium-sized oval reservoir and long duct. Penis as long as free oviduct, internally with large stimulator and opposing pilaster inside its proximal part. Vas deferens long, thin, enters penis apically through base of penial retractor and opens into long deep furrow on side of stimulator.

**HABITAT.** — Primary forest, under leaf litter on granitic or lateritic soil.

#### REMARKS

The description of *P. theoripkeni* n. sp. extends not only our knowledge of the geographical distribution

of the genus *Pseudosubulina* (previously known with certainty from Mexico only) but also the diagnosis of the genus. Our knowledge of the anatomy of this genus is still very limited but it is evident now that internal penial structures vary from three main opposing penial pilasters in the type species (*P. berendti*; see Baker 1939) to the stimulator and the opposing single pilaster in *P. theoripkeni* n. sp. This opposing functional pair is already present in the penis of *P. berendti* and has been further enhanced in *P. theoripkeni* n. sp.

#### *Pseudosubulina nouraguensis* n. sp. (Fig. 5)

**TYPE MATERIAL.** — Holotype: French Guiana, Réserve naturelle des Nouragues, Nouragues field station (c. 4°05'N, 52°41'W; K10 square), 85 m a.s.l., T. E. J. Ripken & O. Gargominy, 20.XI.1997, leaf litter on lateritic soil in a natural forest gap (INVMAR21054), MNHN 25073.



Paratypes: same data as holotype, 2 specimens, MNHN 25074.

TYPE LOCALITY. — Nouragues field station (c. 4°05'N, 52°41'W), Réserve naturelle des Nouragues, French Guiana.

ETYMOLOGY. — The name of the species relates to its type locality.

DIAGNOSIS. — Shell not umbilicate, slender, turritid with straight outline and obtuse apex; consists of up to 10 tightly coiled, slightly shouldered whorls with a deep straight crenulated suture. Protoconch glossy with faint radial and spiral sculpture. First whorl of teleoconch with well-defined radial ribs about same width as intercostal spaces. Surface of later teleoconch whorls with well-defined broad radial ribs much wider than intercostal spaces and with extremely faint, uneven and wavy spiral sculpture. Apertural dentition consists of columellar and basal lamellae and palatal tubercle, repeated half whorl from the apertural set within penultimate whorl.

#### DESCRIPTION (HOLOTYPE)

Shell of small size for the genus (height 6.8 mm, major diameter 1.9 mm), not umbilicate, dextral, slender, turritid with straight outline, rather thin, translucent, pale corneous. Whorls 10, slightly shouldered with a deep straight crenulated suture all the way to the aperture. Protoconch 2+ whorls, glossy with faint radial and spiral sculpture. Protoconch/teleoconch transition distinct because of change in macrosculpture. First whorl of teleoconch with well-defined radial ribs about same width as intercostal spaces. Surface of later teleoconch whorls with well-defined broad radial ribs much wider than intercostal spaces and with extremely faint, uneven and wavy spiral sculpture. Growth lines not visible. Aperture elongated, orthocline, with approximately 90° columellar-basal angle, cut by penultimate whorl, with faint whitish parietal callus enhanced on columellar edge. Apertural dentition of deeply sited, strong, short palatal tubercle, perpendicular short basal lamella about same distance from aperture edge as palatal one and large spirally curving downward columellar lamella. Penultimate whorl furnished with exactly the same dentition positioned half whorl from the apertural set. Peristome simple, acute, not reflected.

HABITAT. — Primary forest, under leaf litter on lateritic soil.

#### REMARKS

With respect to shell morphology, *Ischnocion triptyx* (Pilsbry, 1907) (forming the monotypic genus in the Subulinidae Fischer & Crosse, 1877) described from Colombia, is somewhat similar. However, *P. nouraguensis* n. sp. is almost definitely a spiraxid and *Ischnocion* has a parietal lamella that has never been observed in any species of Spiraxidae. Yet, the taxonomic position of *P. nouraguensis* n. sp. is problematic even within the Spiraxidae. The entire family is in great need of revision since the anatomy is not known for most of the described species (see Baker 1926). What can be observed from the limited material available is that the Recent Spiraxidae are probably remnants of an ancient clade represented today by few well-defined generic level taxa, many of which are monotypic in the current classification. We hypothesise that similarity of the shape of embryonic whorls is much stronger evidence of phylogenetic relationships than the presence or the lack of apertural lamellae in this family. We also suggest that the presence of apertural lamellae in the Spiraxidae is a symplesiomorphic character that has been lost independently in many taxa. All six species of Jamaican *Spiraxis* Adams, 1850 (including all its subgenera), as well as Venezuelan *Spiraxis* (*Ravenia*) *blandi* (Crosse, 1873) have pointed protoconch and therefore we cannot describe *P. nouraguensis* n. sp. within this genus despite some similarities with *Spiraxis* (*Euspiraxis*) Pfeiffer, 1854 in the apertural armature. Thus, we describe *P. nouraguensis* n. sp. as *Pseudosubulina* based on the turritid shape of the shell with an obtuse apex, despite the presence of the apertural lamellae, which have never been recorded in this genus; refraining from the description of another monotypic generic level taxon, pending the revision of the family Spiraxidae. This extends the diagnosis of the genus *Pseudosubulina*, which now includes species with palatal teeth and columellar lamellae.

#### DISCUSSION

It is currently difficult to quantify the biodiversity of terrestrial molluscs in Guyana. In 1859, Drouët wrote: "At first, when you are in the presence of this lush nature, these immense forests where plant life is very abundant and overflows everywhere, we imagine



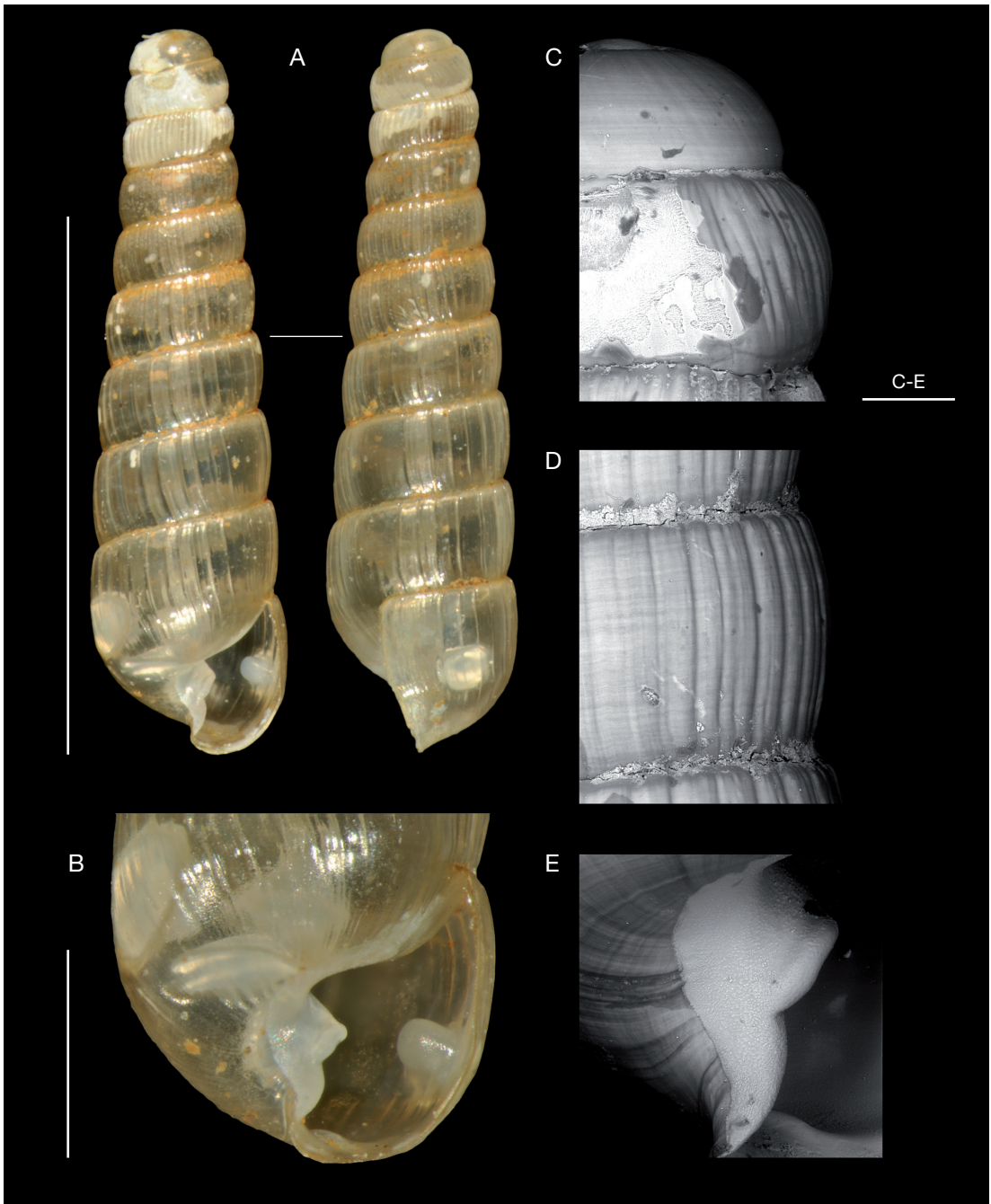


FIG. 5. — *Pseudosubulina nouraguensis* n. sp.: **A-E**, holotype MNHN 25073; **B**, magnified apertural dentition; **C**, details of protoconch sculpture; **D**, details of teleoconch sculpture; **E**, details of collumelar surface sculpture. Scale bars: A, 5 mm; B, 1 mm; C-E, 200  $\mu$ m.

that the molluscs, mainly phytophagous, would be abundant and represent a large part of the beings inhabiting these majestic solitudes... This is not, in fact, the result of observation. By contrast, molluscs appear to be generally rare, and sometimes it is necessary to scan large areas before encountering a favorable locality. [...] The alluvial soils appear to be more favorable to the proliferation of these animals compared to granitic terrain; going further away from the coast, molluscs become much sparser." In 1980, the book by Tillier lists "only" 52 species from historical collections as well as from the material collected in 1977 and 1978.

However, in 1997 and 1999, surveys involving intensive sieving of the leaf litter have changed the situation: a very rich fauna of tiny species (less than 2 mm, mostly new to science) and quite rare (less than five specimens) was discovered in the forest of the Réserve naturelle des Nouragues (Gargominy & Ripken 1998). 1 km<sup>2</sup> yielded a total of 34 species, 23 among which were never collected before in French Guiana. These 23 species, which account for about 1/3 of the molluscan fauna of French Guiana, clearly illustrate the need for further scientific exploration of that territory where an estimated one hundred species is yet to be discovered. It should also be noted that the local diversity, with a record of 19 species from 1 m<sup>2</sup>, is very high considering the lack of limestone.

The lack of knowledge is not only a matter of number of species: despite hundreds of years of taxonomic studies on the terrestrial molluscs of Central and South America, the current description of three new species requires noticeable alteration to the current taxonomical system, with the establishment of a new genus and emendation to the diagnosis of a previously known genus. Future explorations of French Guiana will surely bring us many more fascinating discoveries.

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